Hydrol. Earth Syst. Sci. Discuss., 10, C229–C231, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C229/2013/
© Author(s) 2013. This work is distributed under
the Creative Commons Attribute 3.0 License.

Hydrology and Earth System Sciences Discussions

Interactive comment on "Physically based modeling of rainfall-triggered landslides: a case study in the Luquillo Forest, Puerto Rico" *by* C. Lepore et al.

C. Lepore et al.

chlepore@mit.edu

Received and published: 6 March 2013

Dear Prof. Romano,

Thank you for your interest in our contribution and the constructive comments.

We will carefully check the reference list and add the missing references you mentioned into the revised manuscript. Please find here the missing references (please note that De Vita and Reichenbach, 1998 is De Vita et al., 2008):

- De Vita, P., Reichenbach P., Guzzetti F., Bathurst J.C., Borga M., Crosta G., Crozier M., Glade T., Hansen A., Wasowski J., 1998. Rainfall-triggered landslides: a reference

list. Enviromental Geology 35, 2–3.

- Vanapalli, S. K., and Fredlund, D. G., 2000. Comparison of different procedures to predict unsaturated soil shear strength, in: Advances in Unsaturated Geotechnics edited by: Shackelford, C. D., Houston, S. L., and Chang, N., ASCE Geotechnical Special Publication, American Society of Civil Engineers, Utah State University, Logan, Utah, 195-221.

The greek letter 'chi' mentioned in your comment refers to a parameter in the shear strength equation for unsaturated soils stated by Bishop (1955, 1959). As reported by Vanapalli and Fredlund (2000) and by many other scientific works (Bishop and Blight, 1963; Fredlund and Rahardjo, 1993; Loreta B. and Khallili, 2002; Khallili et al., 2004; Wan et al., 2011; Zargarbashi and Khalili, 2011) 'chi' refers to an 'effective stress parameter' which is assumed to vary from 0 to 1 and which depends on the effective saturation, but it is not necessarily defined as the effective saturation. In fact, the 'chi' parameter can also be expressed through different formulations, as mentioned in our manuscript (Line 12-13, pag. 8).

According to your suggestions, we will better specify the definition of the 'chi' parameter in our manuscript, making explicit reference to the effective saturation. However we agree with Bishop (1955; 1959) and the large portion of literature listed above that defines it as a parameter.

Since the effective saturation is a function of the matric pressure head, then if follows that the shear stress depends on the matric pressure head, according to your observations.

We appreciated the time you spent in reviewing our manuscript and your comments, which will be surely helpful for revising the manuscript.

References

Bishop, A. W., 1955. The use of the slip circle in the stability analysis of slopes,

Geotechnique, TS5, 7–17.

Bishop A.W., 1959. The principle of effective stress. Teknisk Ukeblad 106 (39), 859-863.

Bishop A. W., Blight G. E., 1963. Some Aspects of Effective Stress in Saturated and Partly Saturated Soils. Géotechnique, Volume 13, Issue 3, pages 177 –197, ISSN: 0016-8505, E-ISSN: 1751-7656

Fredlund D.G., Rahardjo H., 1993. Soil mechanics for unsaturated soils. John Wiley & Sons, New York.

Khalili N., Geiser F., and Blight G., 2004. Effective Stress in Unsaturated Soils: Review with New Evidence." Int. J. Geomech., 4(2), 115–126. doi: 10.1061/(ASCE)1532-3641(2004)4:2(115)

Loreta B., Khalili N., 2002. An effective stress elastic–plastic model for unsaturated porous media. Mechanics of Materials, Volume 34, Issue 2, pages 97–116.

Vanapalli S. K., Fredlund D. G., Pufahl D. E., and Clifton A. W., 1996. Model for the prediction of shear strength with respect to soil suction, Can. Geotech. J., TS21, 379–392.

Vanapalli S. K., and Fredlund D. G., 2000. Comparison of different procedures to predict unsaturated soil shear strength, in: Advances in Unsaturated Geotechnics edited by: Shackelford, C. D., Houston, S. L., and Chang, N., ASCE Geotechnical Special Publication, American Society of Civil Engineers, Utah State University, Logan, Utah, 195-221.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 1333, 2013.